

NASA

Lyndon B. Johnson Space Center

# Space News Roundup

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National Aeronautics and Space Administration

## 51-G mission: 3 satellites and Spartan

### News Briefs

#### Spartan Halley mission

When Comet Halley nears perihelion early next year, it will be observed by instruments launched and retrieved by the Shuttle. Objective of the Spartan Halley mission is to measure ultraviolet emissions from the comet close as 10 degrees to the Sun to determine the composition of its coma and tail during the period of peak comet activity. Instruments mounted on a Spartan carrier will be deployed into low-Earth orbit to observe the comet for 2 days, recording data on magnetic tape. Shuttle will then retrieve the free flier and return it to Earth. By operating away from the Orbiter, the spacecraft can be pointed more precisely for a longer period of time.

#### First "small payload"

The first payload has been manifested under the terms of NASA's recently-announced small payload policy.

Hitchhiker G-1, provided by the NASA Goddard Space Flight Center, will consist of several experiments onboard a carrier mounted to the side of the cargo bay. This payload will use power, telemetry, commands and a hand controller in the crew compartment.

The experiments will measure the particulate environment around the Orbiter and test a new heat-transport system in zero-G. Hitchhiker G-1 is presently manifested on STS 61-C.

#### Back-to-back launches planned

Two interplanetary spacecraft will be launched six days apart next year because of the advantageous relative positions of Jupiter and Earth. Ulysses, a probe of the Sun's polar regions, is scheduled for launch May 15. It will use Jupiter's gravity to reach a solar polar orbit. Galileo, which will observe Jupiter and probe its atmosphere, is targeted for May 21. Both spacecraft will use the high-energy Centaur upper stage, the first use on the Shuttle. To perform these back-to-back launches, as well as support the increasing flight rate, NASA is readying a second launch pad (launch complex 39B) and associated ground facilities at the Kennedy Space Center.

#### Crew systems ends test

A comprehensive verification test program of the RTG Radioisotope Thermoelectric Generator RTG cooling system including flight hardware and ground support equipment to be used at Kennedy Space Center during prelaunch activities was successfully completed for the Galileo mission and Ulysses mission by Crew Systems Division. The tests validated the hardware, procedures and timelines for ground servicing and cooling of the Galileo and Ulysses RTG's, transfer to Orbiter cooling and on-orbit purge of the coolant using Orbiter nitrogen.

The Galileo and Ulysses payloads to be launched by the Shuttle are unique in their usage of a nuclear power source. The RTG unit generates a large amount of waste heat that results in surface temperatures greater than 350°F. A cooling loop is provided to cool and transfer heat to the Orbiter for rejection. The RTG's are installed on-the-pad as late in the launch activities as possible for personnel safety.



Daniel C. Brandenstein  
Commander



John O. Creighton  
Pilot



Steven R. Nagel  
Mission Specialist



John M. Fabian  
Mission Specialist



Shannon W. Lucid  
Mission Specialist



Patrick Baudry  
Payload Specialist



Sultan Salman Al-Saud  
Payload Specialist

Three communication satellites and a free-flying astronomy x-ray galaxy mapper will be deposited in Earth orbit in mid June as the Space Shuttle flies for the 18th time.

Crew members of the Shuttle Mission 51-G are Daniel C. Brandenstein, Commander; John O. Creighton, Pilot; Mission Specialists Steven R. Nagel, John M. Fabian and Shannon W. Lucid, and Payload Specialists Patrick Baudry, France, and Sultan Salman Al-Saud of Saudi Arabia, representing the ARABSAT consortium.

Mission 51-G, which will be *Discovery's* sixth flight, can be launched no earlier than June 14. It is a seven day flight, landing on day eight. The early morning launch will place *Discovery* on an orbital inclination of 28.45 degrees at an altitude of 219 by 220 statute miles.

*Discovery's* payload bay carries the three communications satellites: Morelos-A, a Mexican spacecraft; ARABSAT-1B, for the Arab League; and Telstar, for American Telephone & Telegraph (AT&T). Once deposited in space, each will be spring ejected from the cargo bay. On each, a small attached rocket called Payload Assist Module (PAM) will be ignited about 45 minutes after deployment. Between deployment and PAM ignition, the Shuttle will be maneuvered to a safe distance. The end effector camera on the robot arm will observe the perigee kick motor firings. The PAM stages propel the satellites to geosynchronous transfer orbits about 22,300 miles out.

A second small rocket motor fires on each to circularize the orbit.

The free-flying satellite is named SPARTAN 101, acronym for Shuttle Pointed Autonomous Research Tool for Astronomy. Unlike the others, it will be removed from the orbiter's payload bay and handed into space by *Discovery's* Remote Manipulator System (RMS) robot arm, then retrieved a day before the spacecraft's return to Earth.

The SPARTAN is an extension of the NASA sounding rocket program and is sponsored by the

Goddard Space Flight Center. The scientific instrument aboard SPARTAN comprises two large x-ray proportional counters equipped with collimators. Designed by the U.S. Naval Research Lab, the instrument will produce x-ray maps of the Perseus cluster of galaxies and the center of the Milky Way Galaxy.

Morelos is the first general communications satellite to serve Mexico. Built by Hughes, it will provide television, telephone and wire services through a complement of 22 transponders. It will be boosted to a geosynchronous orbit by a PAM-D upper stage and be maneuvered to its permanent placement longitude of 113.5°W.

ARABSAT, second of two such communication satellites, was built by the French aerospace corporation, Aerospatiale. It will transmit S and C band frequencies over 26 transponders to provide domestic and regional communications including educational television. Final longitude is to be 26°E.

Telstar 3-D is a domestic satellite sponsored by AT&T and built by Hughes. It will transmit voice, video and data over 24 transponders through C-band frequencies. Once in geosynchronous orbit, it will provide telecommunication services to receivers in the continental United States, Alaska, Hawaii and Puerto Rico. With a final placement longitude of 76°W, the satellite will replace the operational AT&T COMSTAR satellites.

*Discovery's* launch is set for early morning from Pad 39-A at Kennedy Space Center, Fla. *Discovery* will settle into orbit about 220 statute miles up at an inclination of 28.45 degrees. About 90 minutes after launch, payload bay doors will swing open and preparations for satellite deployment will begin.

Morelos will be the first to be released in mid-afternoon during orbit 7 and *Discovery* crewmen will witness the satellite's solid rocket perigee kick motors firing as it begins its journey to a 22,000 mile hovering point above earth.

Second satellite to be deployed is ARABSAT during orbit 18 at

about 9 a.m. *Discovery's* orbital maneuvering system engines will fire to separate it from the satellite before it fires the PAM solid rocket engine to head for a parking orbit in deeper space.

Astronauts will awaken on flight day 3 to deposit Telstar into space shortly after 6 a.m. on orbit 32. Flight day 4 will highlight the SPARTAN deployment before noon on the 51st orbit. It will be retrieved on orbit 79, day 6.

A number of tests and experiments will be carried out.

The French Echocardiogram Experiment (FEE) by Payload Specialist Baudry will investigate the cardiovascular system's adaption to microgravity using an ultrasonic scanning device to gather data on quantitative blood flow. Test subjects will include several crew members.

The French Postural Experiment seeks to understand the adaption of posture control in zero-g. Measurements will be taken of muscles, angular head movement and up and down eye movements. They are gotten with biochemical electronic sensors, data tape records and a 16 mm camera.

The Automated Directional Solidification Furnace (ADSF) experiment will investigate magnetic properties of low-gravity grown metallic materials, heated and quench-cooled.

The ARABSAT Scientific Experiments (ASE) include photography of Saudi Arabia during *Discovery's* 49 daylight passes over its Southwestern region with a 70 mm camera. To be compared with previous data, analysis will cover geological features, sand dune morphology, hydrogeological features, turbidity in the Red Sea, urban areas and forestry.

A Phase Separation Experiment will demonstrate how Saudi oil mixes with water in weightlessness. Investigators hope to shed light on the process of enhanced oil recovery and behavior of spills and pollution.

The Ionized Gas Experiment (IGE) requires that Al-Saud photograph a strange phenomenon of illumination — exhaust gasses — visible when the Shuttle's small

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## 16 hopeful teachers tour Space Center

Sixteen hopeful school teachers toured the Johnson Space Center while awaiting selection of two to begin training for the NASA Teacher In Space program.

The 16 are among 114 vying for the one seat on the Space Shuttle *Challenger* mission in January. The 114 were selected from 10,463 applications received from the 50 states, U.S. territories, Department of Defense overseas schools and the Bureau of Indian Affairs. Ten finalists and alternates will be announced in mid-July.

The 16 space candidates toured mockups and were briefed by Astronaut Francis R. Scobee, pilot of *Challenger* in the Shuttle's 11th flight. A week-long workshop in Washington, D.C., will update nominees on current developments in the space program.

A national review panel will interview the 114 and select ten semi-

finalists who return to JSC for evaluation by the NASA Flight Participation and Evaluation Committee. From the ten, NASA Administrator James Beggs will select a primary and backup to begin training.

Teachers present for the tour: James Natala, Arvada, Colorado; Robert C. Stack, Greeley, Colorado; Wendall G. Mohling, Shawnee Mission, Kansas; Barry L. Schartz, Goddard, Kansas; Rea Ray, Omaha, Nebraska; James R. Schaffer, Lincoln, Nebraska; Sherry L. Hanson, Dickinson, North Dakota; Donald L. Hoff, Velva, North Dakota; Laura Reeves, Albuquerque, New Mexico; Jennifer Dotson, Vanderwagen, New Mexico; Freda D. Deskin, Pauls Valley, Oklahoma; Frank E. Marcum, Tulsa, Oklahoma; Kevin J. Falon, Sioux Falls, South Dakota; Gerald E. Loomer, Rapid City, South Dakota; Margaret Lathaen, Friendswood, Texas; Stephan A. Warren, Austin, Texas.

## Ham radio on 51-F?

Ham operators may be talking to the Space Shuttle in July through an amateur radio and television station aboard *Challenger* and a program named SAREX.

SAREX, Shuttle Amateur Radio Experiment Plan, is a joint effort by NASA and the Amateur Radio Relay League (ARRL). From space, the radio may be operated during off-duty hours by C. Gordon Fullerton, spacecraft commander; Anthony W. England, mission specialist, or John-David Bartoe, payload specialist.

England, the primary operator, is responsible for early transmissions most likely to be slow scan television rather than two-way contact. By day three, regular contact is expected to begin and England expects to use the limited two-way voice to contact working youth groups paired with ham radio clubs.

## Bulletin Board

### Engineering to sponsor expo June 5 and 6

Again this year, the Engineering Directorate will hold an exposition at the Gilruth Recreation Center. Each division will display, demonstrate and explain various hardware and software developments. On display will be such developments as a voice command system to remotely control television cameras, a Space Station control module mockup, a full scale Spacelab mockup and a variety of other wizardry. The exposition will be open to all employees in the JSC community and their families. The expo will run from 4 p.m. to 9 p.m. June 5 and from 8:30 a.m. to 4 p.m. June 6.

### Brown Bag Seminars scheduled

Upcoming presentations at the weekly Brown Bag Seminar in June include a look at the University of Texas "Big Eye" 300-meter telescope. The seminars are held every Wednesday from noon to one in Bldg. 31, Room 193. On May 29, Don Kessler and D. Schramm will discuss recent measurements of orbital debris impacts on material taken from the Solar Max satellite. On June 5, Drew Potter will discuss Fraunhofer line measurements of the Moon and planets. Pat Rawlings of Eagle Engineering will present some of his space artwork June 12. The June 19 meeting will be an open discussion of the Strategic Defense Initiative program. On June 26, Dr. Harlan Smith of the University of Texas will show a videotape and discuss UT's "Big Eye" telescope. For more information, call Al Jackson at 280-2285.

### HSO to present the Boston Pops

Conductor John Williams and the Boston Pops will stop in Houston for a one concert performance at 8 p.m. July 22 in Jones Hall. The concert is being presented by the Houston Symphony Orchestra. The appearance is part of a 15-city transcontinental tour planned by the Boston Pops organization in celebration of its 100th birthday season. Tickets range in price from \$10 to \$30 and will go on sale June 3 in the Houston Ticket Center at Jones Hall, at all Ticketron outlets and Joske's stores.

## Cookin' in the Cafeteria

### Week of June 3 — 7, 1985

**Monday** — Beef & Barley Soup; Beef Chop Suey, Breaded Veal Cutlet w/Cream Gravy, Grilled Ham Steak, Wieners w/Baked Beans (Special); Buttered Rice, Brussels Sprouts, Whipped Potatoes. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

**Tuesday** — Celery Soup; Fried Shrimp, Pork Chop w/Applesauce, Turkey a la King, Chinese Pepper Steak (Special); Au Gratin Potatoes, Breaded Squash, Buttered Spinach.

**Wednesday** — Seafood Gumbo; Fried Catfish w/Hush Puppies, Braised Beef Ribs, Mexican Dinner (Special); Spanish Rice, Ranch Beans, Buttered Peas.

**Thursday** — Green Split Pea Soup; Corned Beef w/Cabbage & New Potatoes, Chicken & Dumplings, Tamales w/Chili, Hamburger Steak w/Onion Gravy (Special); Navy Beans, Buttered Cabbage, Green Beans.

**Friday** — Seafood Gumbo; Deviled Crabs, Broiled Halibut, Liver & Onions, BBQ Link (Special); Buttered Corn, Green Beans, New Potatoes.

### Week of June 10 — 14, 1985

**Monday** — French Onion Soup; BBQ Sliced Beef, Parmesan Steak, Spare Rib w/Kraut, Chili & Macaroni (Special); Ranch Style Beans, English Peas, Mustard Greens. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

**Tuesday** — Split Pea Soup; Meatballs & Spaghetti, Liver & Onions, Baked Ham w/Sauce, Corned Beef Hash (Special); Buttered Cabbage, Cream Style Corn, Whipped Potatoes.

**Wednesday** — Seafood Gumbo; Cheese Enchiladas, Roast Pork w/Dressing, BBQ Link (Special); Pinto Beans, Spanish Rice, Turnip Greens.

**Thursday** — Beef & Barley Soup; Roast Beef w/Dressing, Fried Perch, Chopped Sirloin, Chicken Fried Steak (Special); Whipped Potatoes, Peas & Carrots, Buttered Squash.

**Friday** — Seafood Gumbo; Fried Shrimp, Baked Fish, Beef Stroganoff, Fried Chicken (Special); Okra & Tomatoes, Buttered Broccoli, Carrots in Cream Sauce.

## Gilruth Center News

Call x3594 for more information

**CPR** — Learn the basics of cardio-pulmonary resuscitation in two short days. This course may come in handy for almost every person. The two night course meets on June 18 and 19 from 7 until 10 p.m. Cost is \$10 per person.

**Beginning country and western dance** — This course starts June 10. This will be the last session for the summer. Class meets for 4 weeks from 7:30 to 9:30 p.m. Cost is \$20 per couple.

**Tennis class** — This course is designed to teach the fundamentals, including forehand, backhand service, foot work, body movement and conditioning. Class begins Monday, June 3 from 5:15 - 6:45 for eight weeks. Intermediates will help you develop and improve all your strokes. Class begins Wednesday, June 5 from 5:15 - 6:45 for eight weeks. Cost for the classes is \$28 per person.

**Scuba** — This six week NAUI certified basic scuba course begins June 17 on Mondays from 6:30 until 9 p.m. Pool sessions on Wednesday start at 7 p.m. Cost for this class will be \$45 per person. No equipment necessary prior to the first meeting. Enrollment is limited.

**Ladies weight training** — This popular course begins June 10 and runs for 4 weeks. Class meets on Mondays and Wednesdays from 7 until 8 p.m. Cost is \$20 per person. Limited enrollment exists. First come, first serve basis.

**Word processing** — Learn all about Wordstar. If you learn Wordstar, you will be able to apply it to IBM, Apples, etc. In this course you will learn letters, resumes, and other documents. This six week course begins June 12 and runs from 5:30 until 8:00 p.m. The cost is \$190 per person.

**Intermediate advanced shorthand** — The multi-purpose skill! In this course you will learn the basics for reading and writing Gregg shorthand. You will work on speed building. This is a valuable skill to learn. Bring a shorthand notebook and pen to class. This 6 week course begins June 12 from 5:30 until 8 p.m. with a cost of \$85 per person.

# 51-G mission

(Continued from page 1)

rockets fire and interact with the minute atmosphere of space. Experimenters hope to solve the fluid dynamics phenomena which occur close to the Shuttle and may adversely affect operations, measurements, data transmissions and communications of space vehicle. Al Saud also will photograph the ARABSAT satellite's rocket engine firing.

Al-Saud will assist French Payload Specialist Baudry in the Postural Experiment on the adaptation mechanism of the sensory motor activities.

Al-Saud also will try to see and photograph the crescent of the new moon with the unaided eye from Orbiter windows as it becomes

visible immediately after sunset June 17 or 18.

The High Precision Tracking Experiment (HPTE) is an Air Force test to determine if a laser beam can track a spacecraft in low Earth orbit. One of three available 60-second data acquisition passes will be made to "lock on" to an eight-inch diameter retroreflector mounted in a cylindrical housing on *Discovery's* middeck side hatch window where it will receive and reflect a low-energy laser beam.

Six Getaway specials are planned. One will study the behavior of liquid propellants in tanks at low gravity. Others deal with ceramic materials; an attempt to produce Manganese-Bismuth metallic specimens with better magnetic

properties than those produced on Earth; and nine biological and physical science experiments from El Paso and Ysleta, Texas, high schools. They will study plant, bread mold, algae, and bacteria growth, brine shrimp hatching, liquid laser fluid action, crystal growth, and temperature and low gravity effects on computer chips.

A Space Ultraviolet Radiation Environment (SURE) experiment is designed to observe emissions from near-space and Earth's upper atmosphere.

A Capillary Pump Loop (CPL) experiment will study the priming of capillary pumps in zero-g and demonstrate that an isolation wick can prevent liquid drainage in event of dryout.

## NASA laser to clean arteries

NASA scientists have adopted a laser originally designed to measure gases in the atmosphere to the task of cleaning out clogged arteries without harming the walls of the blood vessels. The technique, when perfected, could allow patients to avoid coronary bypass surgery.

Physicians at Los Angeles' Cedars-Sinai Medical Center and laser scientists at NASA's Jet Propulsion Laboratory recently teamed together to develop a laser system designed to non-surgically clean clogged arteries with unprecedented precision.

The system, called the excimer laser, someday may allow patients with arteriosclerosis to avoid coronary bypass surgery.

The excimer laser originally was developed at JPL to measure gases such as ozone in the Earth's atmosphere. Investigations into its application to medicine began a year and a half ago when Cedars-Sinai physicians Warren Grundfest, Frank Litvack and James Forrester, conducting research into the potential of lasers in cardiology, sought a more precise and cooler laser than those currently available for use in medicine.

They found such a laser in the form of the excimer, developed by a JPL laser research team of Drs. James Laudenslager, Thomas Pacala, Stuart McDermid and David Rider. Working with the Cedars-Sinai physicians and a fiber optics consultant, Dr. Tsvi Goldenberg, the JPL team refined the laser for the delicate cardiovascular cleaning procedure devised by the medical researchers.

Lasers are used in many medical applications where precision cutting or welding is required, but have not been used with much success for the treatment of cardiovascular disease. Laser energy, if misdirected, can easily perforate delicate arterial walls and when plaque is burned away with most lasers, a rough, singed surface is left that tends to reaccumulate new plaque.

Laser energy can be used to heat matter, to illuminate it or to produce kinetic energy that breaks the molecular bonds of the material. In the case of the excimer laser, "We don't want to heat, just remove the plaque," says Laudenslager of JPL.

Tissue cells can withstand heat up to 154 degrees Fahrenheit. Tissue near the plaque irradiated by the pulsed excimer laser tests never reached temperatures higher than 149 degrees F., so there is no danger of burning or singeing artery walls.

This represents a vast improvement over other lasers used experimentally in laser-cardiology techniques, which heated tissue local to the irradiated area to temperatures ranging from 428 to 500 degrees.

Using a new technology of glass magnetic switches patented by JPL, the xenon-chloride excimer laser can be made to produce a uniform beam of energy that can be controlled and pulsed in an extremely short period from 10 billionths of a second to 200 billionths of a second (compared with hundredths of seconds for other medical lasers).

One pulse of the excimer laser

cuts away microns of plaque with great precision reducing the danger of perforation.

The procedure involves threading a 1.5 millimeter diameter catheter through coronary arteries. The laser light is carried through one of three bundles of fibers within the bendable catheter. Another group of fibers shines a light at the tip of the catheter. A third fiber bundle within the catheter has a lens at its tip to provide video pictures of the inside of the artery. Clear liquid is flushed through the catheter to push back blood for a clearer picture. Fiber optics consultant Goldenberg developed the tiny fibers needed for the system.

Watching the video picture fed through the fiber optics, the physician can spot areas of plaque build-up and fire short bursts of the excimer laser that vaporize the material. The plaque disintegrates. The process occurs so quickly that the neighboring tissue is spared from damage.

In excimer laser experiments on living laboratory animals, cadavers and on arteries removed from heart patients, a typical coronary blockage has been cleared in 2 minutes.

While the researchers are being properly cautious in their predictions of the laser's medical potential, they are encouraged by the results of experiments carried out to date.

Development of the excimer laser was funded by NASA's Office of Space Science and Applications.

## \*Origin of life: "soup" or clay?

A discovery by NASA scientists provides additional support for an emerging theory about the origin of life on Earth. The theory is that organic life did not arise from an accidental combination of chemicals and energy in a primordial "soup" on the primitive Earth but from a combination of chemicals that were selected and combined in an orderly process found in ordinary ceramic clay.

Basic to this theory are recent scientific observations which suggest that clay, although composed of inorganic material, nevertheless exhibits life-like characteristics in its ability to select out certain chemicals and to serve as a catalyst of chemical reactions. Some scientists have theorized that clay may also be able to perform additional chemical functions basic to life, including self-replication, growth and transfer of chemical information to other chemical systems.

Many scientists are reluctant to accept this theory about the ability of clay to perform these chemical functions. Nevertheless, even the strongest skeptics believe it deserves further investigation.

According to the clay origin-of-life theory, organic chemicals that

eventually "learned" to reproduce themselves and create life could have come together in an orderly process which first appeared in the structuring and reproductive processes attributed to clay.

The NASA work that strengthens the theory is a finding that clay has the ability to absorb, store and transfer energy which is a necessary process of organic life.

The clay-energy storage and transfer processes were discovered by a group of researchers led by Dr. Lelia Coyne of San Jose State University, working at NASA's Ames Research Center.

According to the new origin-of-life theory which is attributed to A.G. Cairns-Smith of the University of Glasgow, Scotland, clay minerals served as inorganic proto-organisms which were the forerunners of later organisms based on organic compounds. This "clay-life" theory is a major departure from previous origin-of-life theories. These theories propose that the very first proto-organisms formed at random from an array of organic raw materials.

The revised new theory further proposes that inorganic proto-organisms were not only precur-

sors of organic life but also may have provided a transitional evolutionary structure for it. That is, the theory suggests that synthesis of later living organisms based on organic compounds was initially directed by an original inorganic pattern.

The NASA-Ames discovery of energy storage and transfer in clays introduces a new and important aspect to the clay-life theory — in addition to clay's long-known ability to act as a catalyst and its suggested potential for self-replication.

The new evidence shows that clay minerals are capable of engaging in energetic processes which are necessary conditions if it is to be shown that clays have lifelike properties.

This current NASA-sponsored investigation with clays grows out of twenty years of research involvement of Ames scientists in studies of the chemical basis for the origin of life. Scientists besides Coyne recently involved in various aspects of clay research at Ames include Drs. Sherwood Chang, Ted Bunch, James Lawless, Noam Lahav, David White, and Glenn Pollock.

# Visit to a sideways planet

*As Voyager 2 nears, Uranus is about to become a place*

Uranus, the ringed gas giant that rotates on its side, is the next planet targeted to become a place, rather than a point of light, under the gaze of the camera mount aboard Voyager 2.

The venerable deep space probe, hurtling along at 45,000 miles an hour, is now just eight months from its close encounter with Uranus. The close encounter will take place at the same time as Earth turns an eye to Comet Halley, and as NASA readies the first polar Shuttle flight. The spacecraft will pass within 66,000 miles of the planet at 10 a.m. Pacific Standard Time on Jan. 24 (spacecraft time). The signal will take 2 hours, 45 minutes to travel from the spacecraft to Earth. The encounter ends Feb. 25, 1986.

The twin spacecraft Voyagers 1 and 2 were launched in August and September of 1977 on trajectories that would take them to Jupiter and Saturn, then deliver each spacecraft to explore different regions of space outside our solar system. Voyager 1 has completed its planetary encounters, and is returning information as it travels upward through unexplored space in a path away from the ecliptic plane. It will eventually reach interstellar space.

Meanwhile, Uranus and Neptune have been added to Voyager 2's itinerary. After its Uranus encounter, the spacecraft, its flight path changed by that planet's gravity and gaining velocity from the planet's orbital motion, will arc toward Neptune, which it will encounter on Aug. 24, 1989. These gravity-assisted trajectory changes, which require passing each planet at a precise point in space, are the key to Voyager 2's ability to visit all four giant planets in only 12 years.

Like Voyager 1, Voyager 2 will head for interstellar space after its planetary encounters.

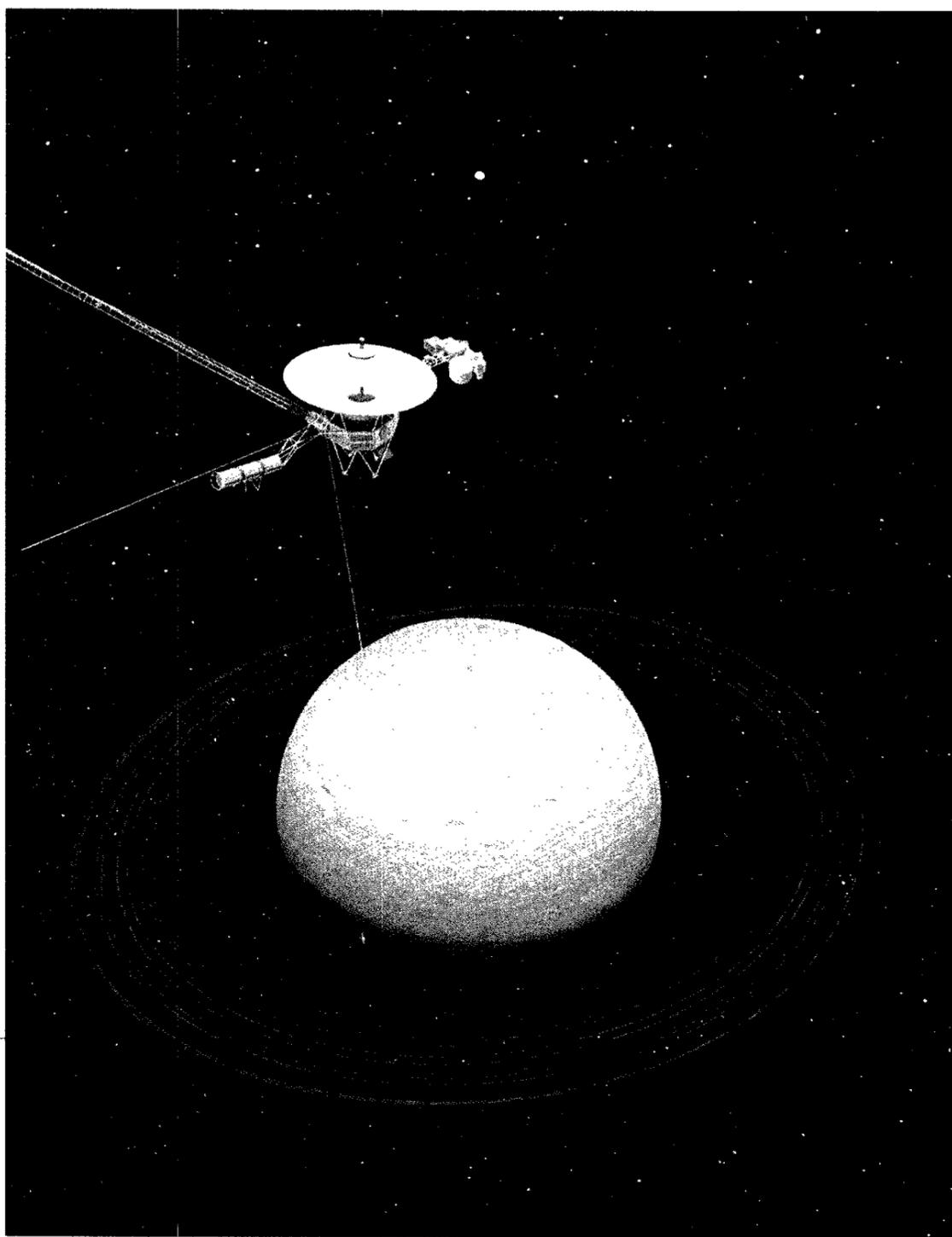
Uranus, the seventh planet from the Sun, orbits at an average distance of 1.8 billion miles over an 84-year period.

Measuring 32,000 miles in diameter, it is the third largest planet in the solar system, about 64 times the volume of Earth.

Unlike any of the other planets except Pluto, Uranus lies on its side. Scientists theorize that in an early stage of its formation, it could have been tipped off of its original axis in a violent collision with another body. Currently, the planet's southern pole faces us.

The planet was discovered by English amateur astronomer William Herschel with a home-made telescope on March 13, 1781. His discovery doubled the size of the known solar system, which at that time ended at Saturn.

Uranus and Neptune are nearly the same size, and are somewhat similar in composition. They are much smaller than Jupiter and Saturn, and are thought to possibly represent what those planets might be like if they were stripped of much of their extensive gas



envelopes. Uranus and Neptune, nevertheless, possess massive atmospheres consisting mostly of gaseous compounds of hydrogen, carbon, nitrogen oxygen and perhaps helium. A layer of melted ices of methane, ammonia and water might exist beneath its atmosphere and hazy cloud layer.

The length of a Uranian day is uncertain. Earth-based measurements indicate that it is either 16 or 24 hours, while theoretical models based on the planet's rotational properties set the day closer to 16 hours.

The planet has five moons whose sizes and compositions are not well known. From the innermost out, they are: Miranda, 310 miles in diameter; Ariel, 825 miles; Umbriel, 690 miles; Titania, 995 miles and Oberon, 1,010 miles.

Voyager will fly within 18,000 miles of Miranda, 79,000 miles from Ariel, 201,000 miles from Umbriel, 226,000 miles from

Titania and 291,000 miles from Oberon.

At least nine thin, black rings surround Uranus; they are among the darkest objects in the solar system. Only three are somewhat circular. The rest are eccentric. The outermost is most dramatic, varying in width by tens of miles.

The ring system was found in 1977 when Uranus passed in front of a bright star, affording astronomers the opportunity to detect the rings as starlight flashed between them.

Scientists assume that because auroral activity has been detected at Uranus, it must possess a magnetic field. (Auroras on Earth and Saturn are caused by the interaction of their magnetic fields with the stream of atomic particles emitted by the Sun, called the solar wind.)

Voyager 2 carries instruments to conduct 11 experiments. Among them are television cameras,

infrared and ultraviolet detectors, and a communications system that doubles as a radio experiment. Three sets of twin computers govern the spacecraft's position in space and its communications and experiments.

Voyager's previous planetary encounters took the spacecraft through planet-moon systems laid out in a horizontal plane, with close approaches to moons and the planets occurring almost one at a time. But because of the rare vertical orientation of the Uranian system, Voyager will fly in and out of the Uranian family of rings, moons and planet in a matter of hours, like an arrow through a target. Nearly all the observations of highest scientific priority occur in the four hours before and two hours after closest approach to the planet.

Voyager 2 will be speeding past Uranus and its moons at more

than 45,000 miles an hour. This velocity poses a problem for the cameras on-board, not unlike the problem encountered by a photographer inside a moving vehicle trying to photograph the passing scenery: Distant objects remain in focus, but to get a still photo of a nearby object, the camera has to move while the shutter is open to compensate for the motion of the vehicle.

Photography during Voyager's high-speed, close approaches to bodies where light levels are low requires the camera to track the target while the shutter is open. This technique, conceived since launch, involves tipping the spacecraft itself, and worked successfully in close-up photography of Saturn's moon Rhea. But since Uranus is twice as far from the Sun as Saturn, light levels are four times lower. In addition, the targets have inherently darker surfaces, so longer exposure times will be required, making image-smearing more of a problem.

The technique of rotating the spacecraft while the shutter is open is called image-motion compensation, and will be used for most of Voyager's closest approaches to the moons and rings of Uranus.

At Uranus, Voyager 2 will:

- Determine the rotation rate of the planet.
- Profile the structure (pressure and temperature) of the atmosphere, and determine the atmospheric composition.
- Measure how much sunlight is absorbed by the atmosphere, and how much, if any, energy is emitted from the deep interior.
- Map the location of clouds and hazes.
- Measure wind speeds at various latitudes in the sunlit, southern hemisphere.
- Search for auroral activity.
- Determine the size, composition and distribution of ring particles.
- Profile the positions and eccentricities of the rings.
- Search for new rings.
- Look for shepherd satellites.
- Measure the sizes and shapes of the moons.
- Map the surface features and composition of the moons.
- Measure the strength, orientation, and charged-particle population of the magnetic field, if one exists.
- Attempt to measure the rotation rate of the magnetic field, and to infer the rotation rate of the planet's interior.

Richard P. Laeser of JPL is the Voyager Project Manager. Dr. Edward C. Stone of the California Institute of Technology is Project Scientist. The Voyager Program Manager at NASA Headquarters is Earl Montoya.

The Voyagers were designed, developed and assembled by NASA's Jet Propulsion Laboratory, which manages the Voyager mission for NASA's Office of Space Science and Applications.

## Miss Liberty gets a new coating

On October 28, 1886, President Grover Cleveland led a million Americans in the dedication of the Statue of Liberty, a gift from the people of France intended to symbolize American freedom. This Fourth of July, to commemorate Miss Liberty's 100th anniversary, the statue will be rededicated after extensive renovation and refurbishment.

Corrosion protection is being provided for the interior structure by a primer coating known as K-Zinc 531, an aerospace spinoff product manufactured by Inorgan-

ic Coatings, Inc., Malvern, Pennsylvania. The coating was developed by NASA's Goddard Space Flight Center as a means of protecting gantries and other structures at the Kennedy Space Center.

KSC's launch facilities require greater corrosion protection than is needed inland because of constant exposure to salt spray and fog. Seeking to reduce maintenance costs at KSC, Goddard conducted a research program aimed at development of a supe-

rior coating that would not only resist salt corrosion but also protect KSC launch structures from the very hot rocket exhaust and the thermal shock created by rapid temperature changes during a space launch. The successful research effort produced a new type of inorganic coating.

At the time of Goddard's research in the early 1970s, there existed a number of anti-corrosion coatings formulated of zinc or aluminum dust in an organic binder, but they required two or

more coats. To counter rising maintenance costs, Goddard sought longer lasting protection with only one coating with a water-based potassium silicate binder, a compound that provides long-term protection with a single application.

In 1981, NASA granted a license for the coating to Shane Associates, Wynnewood, Pennsylvania. The following year, Inorganic Coatings signed an agreement to become sole manufacturer and sales agent under the Shane

license. The latter company assigned the trade name K-Zinc 531 to NASA compound.

Because K-Zinc 531 is water-based, it is non-toxic, non-inflammatory and has no organic emissions. The high ratio silicate formulation bonds to steel in just 30 minutes and creates a very hard ceramic finish with superior adhesion and abrasion resistance. It requires no straining before application and can be easily mixed on site. It is also very easy to apply and saves many labor hours per application.

# Roundup Swap Shop

All Swap Shop ads must be submitted on a JSC Form 1452. The forms may be obtained from the Forms Office. Deadline for submitting ads is 5 p.m. the first Wednesday after the date of publication. Send ads to Roundup, AP3, or deliver them to the Newsroom, Bldg. 2 Annex, Room 147. No phone in ads will be taken.

## Property & Rentals

For sale: League City, 3-2-2, FPL immaculate, good condition, must sell now, best offer. Call 554-6200.

For lease: 1 BR condo, FPL, tennis courts, exercise room, W/D connection, block from NASA. Call 280-6624 or 488-4966.

For rent: Galveston luxury condo, 2 BR, completely furnished, sleeps six, two day minimum, week, month, year. Call Jay Clements, 474-2622.

For lease: University Green, 2-2.5, completely furnished, all essentials provided, minimum three month lease. Call 488-8500.

For sale: Lifetime vacation condo on Lake Conroe with exchange privileges to international condos. Call Don, 280-6307 or 554-6205.

For sale: Waterfront lot on 244 acre lake, access to fishing, tennis, swimming, horseback riding. Call Don, 280-6307 or 554-6205.

For sale: Forest Bend, 3-2-1, 12% FHA assumable or \$51,000, will negotiate. Call 996-9083 after 6 p.m.

For sale: Bar X ranch, one acre, take up payments. Call 996-9038 after 6 p.m.

For sale: Horeshoe Lake Estates, Roymayor, TX, 3-1, A/C, fully furnished, 1 acre, small fishing lake and Trinity river, HWY 105 between Cleveland and Rye. Call Susan, x3138 or 479-5594 after 5 p.m.

For sale: Friendswood/Regency Estates, 4-2-2, 90 x 130 lot, gas utilities, FPL, 2 yrs old, \$102,000. Call 482-3696.

For sale or lease: Lake Conroe and Galveston, luxury condos, exchange privileges to international resorts excellent discounts. Call 326-4022.

For sale/lease: Egret Bay, 1 BR condo, all appliances, fans, waterview, extra nice, no equity. Call 936-2443 or 480-0447 after 5 p.m.

For lease: Meadowbend, 3-2-2, like new, convenient to NASA and South Shore Harbor, \$525/mo. Call Glenn at x6541 or 486-0462.

For sale: El Dorado Trace, 1 BR condo, immaculate, new carpet, ceiling fans, W/D, pool, rec. room, bargain price, low down payment, references, \$28,000. Call Glenn, x6541 or 486-0462.

For sale or lease: League City, 2 or 3 BR, garage, W/D, FPL, ceiling fans, garbage disposal, paid lawn care, marble jacuzzi, microwave, tennis, swimming. Call Mike, at 540-6378 or 280-4313.

For rent: Lake Livingston, 3 BR. Call Jerry, x2576.

For lease: League City, 4-2-2, FPL, fenced, cul-de-sac, near pond, park, tennis court, 3 blks from elem. school, \$575/mo. Call Tim, x2276 or 280-5226.

For rent: Galveston/Tiki Island, 3 BR, furnished, dock your boat, fish, swim, TV, master bath spa, weekend, weekly, and monthly rates. Call 486-9335.

For sale: Pasadena, near Beltway 8 and 225, 3-12, DPISD, trees, C/A & H, 2 ceiling fans, carpet, hardwood floors, \$44,200 or assume \$413/mo, 10% with \$10,000 down. Call Michael, 486-1322 or 477-7059.

For lease: University Green patio home, 2-2-2, FPL, cathedral ceiling, split BR, detached garage, pool access, \$650/mo. Call 488-0500 or 486-6516 evenings.

For sale: 1.8 acres in Friendswood, some financing available. Call Janice, x5867 or 482-6888.

## Cars & Trucks

1980 Rabbit Diesel, excellent condition, 40 m.p.g., \$3,000. Call 474-5824 after 5 p.m.

1980 Monte Carlo, fully loaded, V8, \$3,400. Call Jim, 470-1061 evenings.

1980 Thunderbird Landua-Annix, special mag wheels, A/C, 302 eng., electric seats and windows, AM/FM stereo, 8-track w/converter, new tires, PS, PB, tilt steering, runs well. Call Kathy, x3911.

1980 Olds Regency Diesel, wire wheels, good tires, plush interior, fully loaded, excellent fuel mileage. Call Kathy, x3911.

1979 Toyota Celica, 62K miles, A/C, AM/FM, liftback, nice interior, runs well, \$3,200 OBO. Call 488-3678.

1978 Ford Pickup, F-150 Supercab, camper cover, Ziebert, trailer tow package, clean, low mileage, A/C, tape player. Call 473-2505.

1979 Ford Van Econoline 150, two-tone blue, 6 cylinder, PS/PB/AC, AM/FM, dual fuel tanks, carpet, paneling, \$3,200. Call Valerie, x6251 or (409) 935-1149 after 5 p.m.

1978 280Z 2 plus 2, automatic, 55K miles, excellent condition, \$5,000 OBO. Call Cathy, 333-0757 or 479-6470.

1981 280ZX 5-speed, 29K miles, alarm, rear spoiler, T-tops, silver, blue interior, excellent condition, \$10,300. Call Cathy, 333-0757 or 479-6470.

1973 Chevy station wagon, runs O.K., needs work, \$200. Call Doherty, x5326.

1982 Ford Exp., 24K miles, 4 cylinders, 4 speed transmission, extras, \$3,700 Call Bob, 554-5346 after 6 p.m.

1979 Toyota Celica GT, sunroof, A/C, AM/FM, 49,700 miles, excellent condition, \$3,600. Call Michael Le, x4991 or 484-7527 after 6 p.m.

1975 Olds Cutlass, good tires, runs well, seat on driver's side worn, \$700 OBO. Call Kim, x2375 or 488-0658 after 5 p.m.

1971 Volvo, 66K miles, AM/FM/cassette, interior still good, nice gift for that grad., \$1,000 OBO. Call Tandl, 474-4506.

1979 Renault, two dr., four speed, new paint, runs great, needs minor repairs, \$500. Call Matrenia Anumele, x4031 or 644-0080.

1952 Ford 8N tractor, \$2,250. Call, x6373 or 538-2299.

1974 VW Thing, show winner, 14K miles, \$5,600. Call Monty, x3611 or 333-3672 after 5 p.m.

1974 Mercury Capri, good work on car, \$800 OBO. Call 996-7055 after 5 p.m.

1981 Pontiac T1000, A/C, AM/FM, sunshade, beige, excellent condition, \$3,150. Call Jeff, x4237.

1979 Mercury Zephyr, 106K miles, AC, AM/FM/cassette, good condition, \$1,400. Call C. H. Stewart, x6486 or 738-1489.

1977 Chevy Vega, brown hatchback, not running, body O.K., as is or parts, make offer. Call Max Kilbourn, x3278 or 482-7879.

1976 Ply. Arrow for parts, good Mitsubishi engine, X-Mission. Call Jerry x2576.

1968 Mustang convertible, rebuilt engine. Call Tim, x2276 or 280-5226.

1972 Chevy Stepvan, needs work, convert to camper or work truck, make offer and take it. Call 554-6378.

1984 Toyota Pickup, 5-speed long-bed, bedliner, A/C, deluxe bumper, wide radials, side molding, 5K miles, \$6,700. Call Ramesh, x3486 or 486-9562 evenings.

1979 Ford LTD Wagon, PS, PB, auto, AM/FM, 66K miles, excellent condition, \$2,200, firm. Call Dave, x4611 or 480-4031.

1972 MGBGT, AM/FM cassette, new brakes, fuel pump, needs some body work and paint, current inspection, new tags, \$1,500 OBO. Call William Clark, x3647 or 481-4612.

1967 Mustang coupe 200 Sprint, good condition, must sell, \$2,900 OBO. Call Charles Simon, 480-1889 x264 or 538-2339.

1970 VW Beetle, auto stick shift, 47K miles, AM/FM/cassette, new clutch, boots, windshield, paint, nice interior, \$1,450. Call John, x5301 or 482-8457.

1968 Ford Galaxy, excellent engine and drive train, bad paint, surface rust but no rust holes, good interior, \$400. Call Griffin, x5437 or 481-3984.

## Boats & Planes

Hummingbird depth flasher, like new, \$90. Call Jack Day, x4731 or 664-9472.

Cyclone 13 sailboat, 13 ft, trailer with spare tire, ready to sail, \$1,200. Call Michael, 486-1332 or 477-7059.

Bayliner, 22.5 Skagit Cuddy camper, 160 h.p. Volvo I/O, low hrs., dual battery, CB, stove, icebox, sink, swim platform, stereo, depth finder, full canvas, E-Z loader tandem trailer, \$6,500. Call Ron, 488-0131 or J. T., 488-3452 after 6 p.m.

Big John super-wide 16 inch aluminum boat, fresh water well, decking, capt's. chair and lil' dude trailer, both 1983 and in excellent condition, \$1,500. Call Williamson, x3611 or 332-7082 after 4:30 p.m.

1953 D-35 Bonanza, 950 SMOH, 50 STOH, E225-8, hyd prop., dual Nav-comms, m.b.r., a.d.f. A/P, aux, gas, third window, etc., \$18,000. Call 488-3265.

## Bikes

1971 Honda CB450, 2,400 actual miles, wixom fairing, crash bars, carrier, mint condition, \$1,100. Call 486-9335.

1973 Honda CB350, fairing, luggage rack, 15,000 miles, always garaged, excellent condition, \$300 firm. Call Dean, x5381 or 488-7032.

1981 Honda XL80S, street legal, less than 1,000 miles, excellent condition, \$450 firm. Call Cheryl, 538-3043 after 5 p.m.

1981 Honda CB750, 2,000 actual miles, excellent condition, \$1,400 OBO. Call 488-4915.

26 inch mountain bike with 21 inch frame, ten speed, gloss black with chrome trim. Call 488-2822

1981 Kawasaki LTD 1000, 10,500 miles, excellent condition, \$1,000; KX250, new top end, runs great, \$400. Call Ferdinando Garcia, x4474 or 480-7750 evenings.

Houdaille "Custom" powercam 14 speed bike, 23 inch chrome-Moly frame, hill country and flatland freewheels, \$300 firm. Call Samouce, x4727.

1978 Suzuki GS-5501, Bates Super-shield, luggage rack, travel, trunk, excellent condition, \$600. Call Ray, x3278 or 554-7378.

Raleigh Rampar bicycle, 11 inch frame, 13 inch wheels, red, boy-girl, convertible, training wheels, \$50. Call Griffin, x5437 or 481-3984.

## Audiovisual & Computers

Beseler 23CII enlarger with Dichro 23 dga colorhead, stab. power supply, PM2 analyzer, El Nikkor 50mm 2.8 and 80mm 5.6 lenses, motor base, neg. holders, timer, more, \$900. Call 326-1775 from 7 to 9 p.m.

T.I. 99/4a computer with extended basic, some games. Call 488-2822.

Apple IIc computer with IIc monitor, external disk drive, image writer printer, Apple works program, \$1,200. Call Ron, x3417.

Heathkit GR295, 25 inch color T.V., \$150. Call Tom Moore, x4405 or 488-4089.

JVC's best cassette audio receiver, model KS-R75 w/high power, auto-reverse, biphonic, more, \$145. Call Tom Clark, x7445.

Realistic shortwave radio receiver, four bands, 420 KHZ 30 MHZ, solid state circuitry, outdoor antenna included, like new, \$50. Call 333-0813 or 996-9715 after 5 p.m.

Timex Sinclair computer, 18K ram, four game and program tapes, two program manuals, like new, \$25. Call David, 333-0813 or 996-9715 after 5 p.m.

Apple II-plus w/176K, two drives, NEC green monitor, 80-column/upper lower case card, system saver, plus software, make offer. Call Randall, x2381 or 332-2827.

Pioneer stereo receiver 45 w/ch, \$90; AKAI cassette deck with Dolby C, \$125; Technics linear tracking programmable turntable with Shure cartridge, \$125; TRON coin-operated video game, originally in arcade, very good condition, \$275. Call 326-3370.

80-200 Vivitar macro/zoom lens for Canon, perfect condition, \$75 OBO. Call 333-4268 after 5 p.m.

## Household

King size canopy waterbed, matching dresser w/hutch, night stand, excellent condition, must sell. Call Linda, x3421 or 480-1967.

GE dishwasher plus extra parts, \$30. Call 333-3382.

Antique oak dining room table, 36 inches square, leaves extend to 60 x 36, spiral legs, excellent condition, \$350. Call Greg, 482-2098 after 6 p.m.

Antique oak Larkin desk, upright, front opening, pigeon holes, etc, fair condition, \$200. Call Greg, 482-2098 after 6 p.m.

King size mattress and box springs with frame, 1.5 yrs. old, excellent condition, \$150. Call Vi, x4596.

Double bed, mattress, frame, box springs, head, foot and side boards, cherry wood, all in great condition, \$150. Call 488-6521.

Spanish carved tall chest of drawers, very lovely, \$85. Call J.H. Levine, 488-5564.

Brown plaid couch and loveseat, \$150. Call Patti, x3796 or 538-4638.

## Musical Instruments

Kawai baby grand piano, polish ebony finish, 1.5 years old, excellent condition. Call Craig, x4231 or 665-1118.

Kimball K600 Stardust theater organ (upgraded), two 61 note manuals, 25 note pedalboard, 50 sounding stops, auto chord, auto rhythm, reverb, etc., \$6,000 firm. Call Samouce, x4727.

Fender precision bass guitar, sunburst finish, case, \$250; Buffet clarinet, master model, \$200. Both instruments in mint condition. Call Don Amann, x2449 or 333-2359.

Holton cornet, excellent condition, \$250. Call 485-4995.

Hagstrum acoustical guitar, \$50. Call 480-8021.

## Miscellaneous

Halsey-Taylor drinking fountain, electric cooling, floor model, \$85. Call

Williamson, x3611 or 332-7082 after 4:30.

Dewalt radial arm saw, \$85. Call 485-4995.

One hundred National Geographics, \$25; IBM electric typewriter, \$175 with extra ribbons. Call 488-5564.

New Leader LSW-333 VHF/UHF TV/FM sweep marker generator, \$190; Eico #390 sweep generator, \$45. Call Tom Clark, x7445.

Super Single waterbed, \$100; Triflex trampoline, 6 x 15 ft., \$300; medium size dog house, \$25, all in excellent condition. Call Janice, x5867 or 482-6888.

Astronomical telescope, 16 inch mirror, 70 inch F.L., fiberglass tube, Novak mounts on Dobsonian mount, 1/20th wave enterprise optics mirror, six ft., F2.7 finder scope, \$1,500. Call 747-3977.

Astronomical telescope, 8 inch mirror, 40 inch F.L., fiberglass tube, two inch finder scope, all brand new, needs mount, \$550. Call 747-3977.

Exercise bike, \$75 OBO; antique loveseat, needs to be reupholstered, wood trim, \$75 OBO. Call 333-4268 after 5 p.m.

Sliding glass patio door, three section, 105 inch wide, \$50. Call 333-3254.

Sears paint sprayer outfit, 115 volt, gauges, paint gun, seventy ft. hose, tire inflator, viscosity gauge, good condition, \$150; Sears electric stapler, like new, \$10; one half inch torque wrench, like new, \$5; electric hedge trimmer with charger, good condition, \$10. Call Parker, x2566.

Queen size comforter, heavy designer fabric, handmade, fabric to make bed ruffle, \$75 OBO. Call 333-4268 after 5 p.m.

Free calico female cat, four kittens to good homes. Call Patti, x3796 or 538-4638 after 4:30 p.m.

Remington model 870 pump, 12 ga., \$150; Alvarez 12-string w/case, \$200; old Sonor four pc. drum set (some H/W), \$100; 185 cm Blizzard skis w/bindings, poles and size 11-12 boots, \$100; CCM men's size 10 hockey skates, \$35. Call Chuck Borne, x6226 or 332-1122 evenings.

Rent my motor home by day or week, self-contained with onboard generator, roof air, the comforts of home on wheels. Call Dave, x5111 or 480-0202 after 6 p.m.

Skamper pop-up camper, like new. Call (409) 925-2390.

Exercise bicycle, \$40; strollee infant car seat, \$15. Call 480-8021.

Golf clubs, Ram fastbacks, four woods, 9 irons, new custom cord grips, standard flex shafts, new Palmer

9 inch bag and head covers, very good condition, \$225. Call Jack Barrett, 280-7807 or 488-6014 after 5 p.m.

Childcraft, The How and Why library, by World Book Encyclopedia, complete and new, \$145. Call Max Kilbourn, x3278 or 482-7879.

Men's stainless steel Rolex Submariner, excellent condition, appraised for \$850, will take \$550; Montgomery Ward 20 inch lawnmower with four h.p. Briggs and Stratton engine, very good condition, \$85. Call 326-3370.

Shrimp net, 25 foot, box net, 2 x 4 ft., marine plywood boards w/steel runners, \$350. Call Dean, x5381 or 488-7032.

Celestron 8 inch telescope, tripod, wedge, coatings, drive corrector, others, \$800. Call Ray, x3278 or 554-7368.

HiFly 700 Sailboard, great shape, \$800. Call 474-5824 after 5 p.m.

Ford van bench, excellent condition, \$140 each or \$250 both; handmade Alpaca fur rug, \$225 each, 5 ft. round or 4 x 6. Call John, x5301 or 482-8457.

National Geographic 1963 through 1984 with six month indices, suitable for binding, \$25; Samsonite 27 inch suitcase, blue, \$30; Four quart Presto pressure cooker, \$14. Call John, x4393 or 488-0559.

Found: Prescription eyeglasses in parking lot across from Bldg. 15, brown case. Call Harry, x4571.

## Wanted

Electric trains, electric typewriter. Call Don Jeffers, x2449.

Motorized treadmill. Call Chuck or Geana, 487-2978 after 5 p.m.

Roommate to share 2-2 condo, \$250/mo. plus half of bills, \$100 deposit. Call 480-8223 after 4:30 or Rick, 485-5341.

Three month old needs someone to spend mornings with, must be responsible and enjoy toothless grins, hours flexible, Seabrook area. Call Jim, 474-4506 after 5 p.m.

Set of mag wheels for a 14 inch 1979 Dodge D-50 truck. Call Ferdinando Garcia, x4474 or 480-7550 evenings.

Housemate to share 3-2-2 in League City/Friendswood area, furnished, W/D, cable, pool table, mirrors, adjacent forest, pool/tennis nearby, \$200/mo. Call Randy, x2381 or 332-2827.

Need ride from Pasadena to NASA, 7 a.m. to 4 p.m., flexible. Call Mary Cunningham, x3580 or 475-1992 after 5 p.m.

## Life Sciences wins safety grand award

The Space and Life Sciences directorate has been cited for outstanding performance in the Johnson Space Center's accident prevention program.

The directorate was selected for the grand award after being named winner of the Group II division, comprised of directorate and program offices involved in moderately hazardous activities.

Winning Group I, organizations with a high degree of potential for hazard, the White Sands Test facility.

Group III division winner, the Space Shuttle Projects office, led offices with minimal hazards.

JSC Deputy Director, Robert C. Goetz, presented the leader of each group with a bronze plaque. Each employee of the Space and Life Sciences directorate was awarded a gold pen.

The accident prevention program, in its second year, recognizes employees who make contributions to the JSC safety effort.

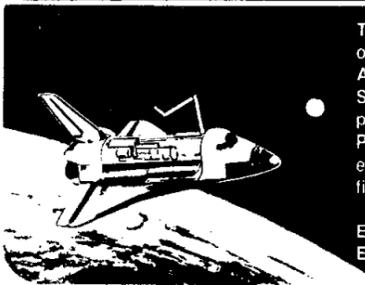
## Weathersby earns TSU doctorate

Samuel Weathersby, NASA program analyst, was awarded a doctorate of education from Texas Southern University. Weathersby received his degree following seven arduous years working at the Johnson Space Center during the day and attending classes at night.

Prior to joining NASA in 1964, Weathersby taught mathematics for three years in the Houston public school system. Weathersby will continue with NASA. He plans to teach at the university level and pursue his interest in classical piano.

NASA  
Lyndon B. Johnson Space Center

## Space News Roundup



The Roundup is an official publication of the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas, and is published every other Friday by the Public Affairs Office for all space center employees. Roundup deadline is the first Wednesday after publication.

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